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The International Commission for the Investigation of the Upper Air

UNDER the Presidency of Sir Napier Shaw, a meeting of the International Commission for the Investigation of the Upper Air was held in London from April 17th to the 22nd, 1925. Representatives from the following countries attended: France, Germany, Great Britain, Holland, Italy, Norway, Russia and Spain.*

At the meeting of the International Union for Geodesy and Geophysics at Madrid in October, 1924, the Union voted the sum of £500 towards the expenses of publication of a specimen volume of Upper Air Data, and Professor van Everdingen, the Director of the Meteorological Institute of Holland, promised a contribution of about £100 for the same purpose. (During the meeting in London Professor Hergesell promised a contribution of £25.)

The meeting of the Commission in London was concerned

* The photograph reproduced on the opposite page, in which the majority of the members of the Commission appear, was taken at the Meteorological Office, South Kensington, after the Saturday morning meeting. The names, reading from left to right, are:—Back row—Capt. P. Wehrlé, France; Sir Gilbert Walker, Great Britain; Col. E. Meseguer, Spain; Dr. L. Matteuzzi, Italy; Mr. L. F. Richardson, Great Britain; Prof. Dr. W. van Bemmelen, Holland; Miss E. E. Austin, Great Britain. Middle row—Dr. Th. Hesselberg, Norway; Prof. Dr. E. van Everdingen, Holland; Sir Napier Shaw, Great Britain; Prof. Dr. H. Hergesell, Germany; Dr. G. C. Simpson, Great Britain; Prof. P. Gamba, Italy. Front row—Mr. L. H. G. Dines, Great Britain; Dr. P. Molchanoff, Russia.

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primarily with the consideration of the form which the specimen publication should take.

The meetings of the Commission were divided into business meetings and scientific meetings, on the ground that a right solution of the questions which the Commission had to consider could only be achieved by a correct appreciation of the scientific principles involved. The right balance was kept by having four business meetings and three scientific meetings.

At the first meeting of the Commission on Friday, April 17th, the President read a letter from Dr. la Cour, Director of the Danish Meteorological Service, giving the Commission the welcome news that four wireless stations would be in operation in Greenland during the coming summer at Angmagsalik, Julianehaab, Godthaab, and Godhavn ; all four stations would be equipped with instruments for observations of pilot balloons, but ballon-sonde ascents would not be practicable. The work of the four stations as regards investigation of upper wind would be co-ordinated by wireless with a view to obtaining simultaneous ascents to great heights from all stations at the same time.

M. Fontseré (Barcelona) sent an account of some observations on oscillations of short period, indicated by the well-known irregularities of the motion of pilot balloons, as seen in a pilot balloon theodolite. These oscillations appear to have a period of about three seconds and do not appear to be due to natural oscillations of the balloon as balloons of different shapes were tried, some being loaded with a lead weight of 65 grammes. The Commission decided to recommend that a similar investigation should be undertaken in other places and that the influence of the size and form of the balloon on the character of the oscillations should be explored and that a comparison of the oscillations observed in balloons with those observed in the tension of kite wires should also be made.

Professor Hergesell referred to the Investigation of the Upper Air at sea by Wegener and Richlbrodt, who were provided with a free passage on a merchant ship in order that they might carry out these scientific observations. Commander Garbett explained what was being done by the co-operation of the Royal Navy in obtaining upper air observations.

(On Friday afternoon, the meeting heard with obvious pleasure that the Airship R. 33, which had broken adrift in a gale on Thursday morning, had reached Pulham with all aboard safe and well.)

After some discussion of the use that should be made of the funds placed at the disposal of the President, the Commission decided that they should be applied to the publication of a specimen volume of Upper Air results for 1923 and 1924, and that in the specimen volume the observations obtained from

ballon-sonde and similar records from the places selected for international investigation, should be published in the form of tables giving full details, and that the tables should be supplemented by graphical representation on " tephigrams." This is the name given to the representation of the results of the ballon-sonde ascents, by plotting corresponding values of the temperature t, and potential temperature θ . This form of representation, which was invented by the President and explained by him at the scientific meeting, is peculiarly appropriate for presenting the results of temperature (and humidity) observations in the upper air. It shows immediately the relation of the temperature gradient observed in the ascent to the adiabatic gradient for dry air and to the adiabatic gradient for saturated air. It shows the energy which would be required to raise air vertically in the atmosphere under the conditions of the ascent, or alternatively, the energy that would be set free in a kilogram of air rising in the atmosphere under the conditions of the ascent. It also has the great advantage of presenting these results in a diagram of very moderate dimensions, even when observations at heights of 50,000 feet or more are included.

Considerable discussion took place on a proposal sent by Dr. Marvin for concentrating all the international ballon-sonde ascents in any one year into a single month. The proposal to obtain ascents daily for a month in addition to ascents on single days in other months of the year, was advocated by Lt.-Col. Gold, at the meeting at Bergen in 1921, on the ground that an International Upper Air Commission ought to deal with world conditions, and nothing less than a month would permit of general world-wide changes being investigated, but it was rejected by the Commission on the grounds that the funds available for upper air investigation should be devoted to obtaining results for detailed investigation on the lines adopted by the Norwegian Geophysical Institute. After much discussion of Dr. Marvin's proposal, it was agreed that countries participating in the international investigation of the upper air should be asked to make, as far as possible, daily ascents distributed throughout a month in each year, the month to be selected by the International Commission, these ascents to be additional to those indicated in the scheme of international days prepared by the Commission at Bergen for the years up to 1928. The first months selected for this more extended investigation is May, 1926, and the next month is October, 1927. (It was considered that the time was too short to warrant an " International Month " in 1925, but it was agreed that any auxiliary ballon-sonde results which any country might be able to make should be made in August.)

In the course of discussion of this resolution, Prof. Hergesell emphasized that the international investigation of the upper air

had two aspects, the world aspect and the regional aspect. From the world aspect ascents over a month would be appropriate, and, from the regional aspect, ascents concentrated into shorter periods of time and made more frequently would lead to better results. Dr. Simpson, following up this line of thought, made the suggestion that the Commission itself should deal only with the world aspect, and should appoint regional sub-commissions to deal with regional aspects. The Commission eventually decided that the regional aspect could, in the meantime, be dealt with satisfactorily by the nomination of Deputy-Presidents in the different regions :—

Europe with Russia, Siberia and North Africa.
North America.
The East Indies and the Philippines.
Australia.
South Africa.
South America.

It was agreed that the six ascents left at the disposal of the President under the arrangements made at the meeting at Bergen in 1921, should be concentrated in the International Months, and the exact dates in the different regions should be left to the Deputy-Presidents for these regions. Dr. Marvin was designated as Deputy-President for North America, and Mr. J. Field for the East Indies.

The question of adopting an international formula for the rate of ascent of balloons, put forward by Dr. Weinberg (Leningrad), led to the appointment of a sub-commission to consider this and other questions relating to balloons, and to report to the next meeting of the commission. The members of the sub-commission are :—

Prof. Hergesell (President), Dr. Hesselberg, Mr. J. S. Dines, Dr. Fujiwhara, Dr. Marvin, Dr. L. Matteuzzi, Dr. Molchanoff, Capt. P. Wehrlé.

The importance of aeroplane observations and the difficulty of securing satisfactory instruments for them, was emphasized by Capt. Wehrlé, and the Commission decided to ask for complete particulars of the instruments and methods used in different countries to be communicated, with a view to their publication in collected form by the French Meteorological Service.

As regards the future, it was decided that the question of a regular international publication could only be settled satisfactorily after the specimen volume had been issued and considered. The question of the publication of results subsequent to 1924 was therefore remitted to the next meeting of the Commission, which it was anticipated would be held at Prague in 1927.

Sir Napier Shaw was unanimously re-elected President of the Commission. Dr. Hesselberg asked permission to resign from

his position as Secretary of the Commission, and proposed Mr. R. G. K. Lempfert as Secretary, on the ground that it was a very great practical convenience for the President and Secretary to be in the same place. The Commission refused to allow Dr. Hesselberg to resign, but unanimously elected Mr. Lempfert as Secretary in addition to Dr. Hesselberg.

On Thursday evening, April 16th, the delegates were entertained by the President at an informal "At Home," at 10, Moreton Gardens, "to break the ice." Various graphical methods of presentation and illustration of upper air results were exhibited, and some interesting photographs were shown illustrating the growth and decay of vortices in a fluid in connection with the theory which Dr. Fujiwhara developed of the vortex motion exhibited in clouds.

On Friday, April 17th, the delegates were entertained to dinner by the Meteorological Office.

On Sunday, April 19th, they were invited by Capt. C. J. P. Cave to lunch at the Beacon Hotel at Hindhead, and subsequently to tea at Stoner Hill, Petersfield, where they had an opportunity of seeing an unrivalled collection of cloud photographs, while the rain outside witnessed to the accuracy of the Meteorological Office forecasts.

On Tuesday afternoon, April 21st, they paid a visit to Kew Observatory in connection with the 75th Anniversary of the Royal Meteorological Society, and on Wednesday evening they were entertained at the 75th Anniversary Dinner of the Society.

The outstanding impression left by the meeting may be illustrated by a remark to me of one of the foreign delegates: "What I like about this international work is the way everybody is ready to help things forward; the only consideration being 'is the thing good?' It is very pleasant."

E. GOLD.

The 75th Anniversary of the Royal Meteorological Society

IN the first volume of the *Proceedings of the British Meteorological Society* there is a quotation from *The Civil Engineer and Architect's Journal* for July, 1850: it refers to "The noble mansion of Hartwell, situated in the fertile vale of Aylesbury, and at the foot of the Chiltern Hills," and goes on: "In the spacious and elegant library Louis XVIII. attached his signature to the document which restored him to the throne of his ancestors. With objects far other than political, a few lovers of science had assembled in this room, at the invitation of the present proprietor, Dr. Lee, on the 4th of April, 1850, for the purpose of taking into consideration the present state of meteor-

ology, and of adopting such measures as might conduce to its advancement. The result of their deliberations was the formation of a Society to be called the 'British Meteorological Society'." Lee was elected Treasurer of the new Society; James Glaisher, Secretary; and S. C. Whitbread, President. Glaisher survived the Jubilee of the Society. There had been two earlier Meteorological Societies, founded in 1823 and 1836 respectively, but they seem to have been loose organisations which never reached the stage of publishing reports. The history of the present Society is continuous from 1850. One change of title occurred in 1866, when the Members of the British Meteorological Society were constituted, by Royal Charter, Fellows of the Meteorological Society. The prefix Royal was sanctioned in 1882.

To celebrate the 75th anniversary of the formation of the Society an appropriate programme was arranged. The afternoon of April 21st was devoted to a visit to Kew Observatory. The same evening there was a reception in the rooms of the Society. On April 22nd the Commemoration Meeting was held in the same rooms (the same, but not the same, for the gallant furniture and carpets, installed for one night only, had disappeared). Four distinguished foreigners, Dr. van Bemmelen, Dr. van Everdingen, Dr. Hergesell and Dr. Hesselberg, were formally presented to the President as Honorary Members, and the congratulatory letters from various scientific bodies were read out. The principal item of the programme for the Meeting was a lecture by Professor van Everdingen, the subject being the use of clouds in forecasting, both local and general. The lesson which was driven home most forcibly was the necessity for the circulation by telegraph of information about the movements of the upper clouds. The same evening there was a dinner at the Hotel Rembrandt. The after-dinner speeches were numerous and excellent, but, perhaps inevitably, too long. One point may be quoted: Sir Phillip Sassoon, in proposing the toast of the Society, referred to the latest demonstration of the practical results of the work to which its energies had been devoted during the past 75 years. "No doubt the reason why the R.33 was able to fight its way back to Pulham last Friday was the splendid skill, courage and cool-headedness of the crew, but it was in a very great measure due, and I think every member of the crew will admit this, to the vital information that the Meteorological Department was able to send to the airship during the whole of the 30-hours' trial."

It remains to be added that, as the organ of a large body of weather students in all parts of the world, the *Meteorological Magazine* conveys their congratulations to the Royal Meteorological Society on passing its 75th birthday, and wishes it all success in the future.

OFFICIAL NOTICES

IN consequence of the retirement of Dr. C. Chree, F.R.S., Mr. F. J. W. Whipple, Superintendent of the British Rainfall Organisation, and Editor of the *Meteorological Magazine*, has been appointed, on the nomination of the Meteorological Committee, Superintendent of Kew Observatory, with the rank of Assistant Director in the Meteorological Office.

On the occasion of the retirement of Dr. Chree, the Meteorological Committee at their meeting on March 11th, 1925, placed on record their high appreciation of the services he had rendered to meteorology and geophysics generally. In particular they desired to record their estimation of the value of his contribution to our knowledge of magnetism. The Committee instructed that a letter should be sent to Dr. Chree in these terms, and expressing the hope that he will continue his magnetic researches, for which the Meteorological Office will give him all possible facilities.

Correspondence

To the Editor, *The Meteorological Magazine*

A Plunge through a Line Squall

IN the February issue of the *Meteorological Magazine* a note on "A Plunge through a Line-squall" was followed by a request for further information.

The notes entered in the Pocket Register of observations at this station are as follows:—

December 31st, 1924.

7h. G.M.T. Sea and wind rose rapidly ("rather rough" by mid day) with gale force "7-8."

7h. 30m. Heavy rain shower, with strong squall (frequent later). Threatening sky from which a moderate shower fell was followed by a clearance and at

8h. 30m. sky was "b" and the barometer rose again, while the wind of force "6-8" veered from W. to NW. temporarily. The wind then backed to WSW. and at

9h. there occurred a line-squall effect accompanied by strong winds and heavy shower of rain and hail, and a veer of wind to WNW.

It will be noted that here too the squall occurred after the rise in pressure by a lapse of half an hour. It was by no means a definite line-squall but there was evidence of all the associated phenomena—though they were mild—except for the cloud "line" which was scarcely anything more than a line of heavy cumulo-nimbus which is not uncommon in the type of weather prevailing at this period. Temperature fell at 9h. at the rate of 3° F. in an hour, rising again at 10h. from 41° F. to 47° F. at

12h. when a sudden fall of 3° took place, followed by a gradual but unsteady rise through the remainder of the day and night.

It is interesting to note that on two or three occasions during the gale period at the close of December a rise in pressure was followed closely by a backing wind, suggesting very complex disturbances in the normal pressure distribution.

T. H. APPLEGATE.

Cattewater, Plymouth. April 13th, 1925.

WITH regard to Mr. Walker's letter in your April issue about "dark squalls," I think that spells of great gloom are most apt to occur, with or without squalls, at the time of a shift of wind to the North.

I noticed an example at Godalming on the 19th, at about 13h., although the gloom lagged unusually behind the invasion of the North wind (NE in this case). People said it was due to drift of smoke from London, but this theory involves an over-pessimistic view of normal conditions here, and does not account for such occurrences in other parts of the country.

Someone tells me that the London sky is often darkened by celebration of the Sunday joint cult, but, even if this feast contributed to the case mentioned, one imagines that the main cause is connected with a fall of temperature. Can you say if this is so?

G. WESTON.

Conservative Club, St. James's Street, S.W.1. April 23rd, 1925.

[These "dark squalls" are usually associated with instability showers which occur when a polar air current is passing over warm land or sea, *i.e.*, in cold air which is being warmed from the bottom.—ED. *M.M.*]

Possible Errors in Annual Rainfall Totals obtained by the Summation of Daily Records

FOR records (in inches) made for the Meteorological Office only two places of decimals are employed. But the numerical statement of a measurement is never more than an approximation to the actual observation. Thus, the record ·01 or 1/100 of an inch simply means that the amount of rain observed was more than ·005 and less than ·015 in. In computing the rainfall of a whole year, we are therefore adding together 150 to 250 numbers, most of which contain fractional inaccuracies, and, as far as I know, nobody has ever attempted to ascertain whether in the long run these errors tend to aggravate or to annul each other.

There are two methods by which these accumulating errors

can (in the record for the whole year) be reduced to an insignificant amount:

1. The very open scale of the new graduated measure* makes it quite possible for an observer to read to three decimal places and thus to produce a record in which the individual inaccuracies are only about a tenth the magnitude which was possible with the older forms of graduated cylinder.

2. If all the water removed from the gauge is (after measuring) poured into a bottle, which can be stoppered to prevent evaporation, it can be re-measured in bulk at long intervals—say once a month, and this measurement will be free from the accumulated inaccuracies of the arithmetical summation.

From January 1st of this year I have been employing both these methods, and hope to continue them throughout the year, but it may interest observers to see the result of the first three months.

Total Rainfall of January, February and March, 1925.

Arithmetical total of 48 daily records to 2 decimal places	5·01 in.
Arithmetical total of 60 readings to 3 decimal places (This includes 12 " traces " which would not appear in the summation of the official record)	5·005 in.
Re-measurement, at end of each month, of the stored water	5·01 in.

From this short set of observations it would appear that the excess and deficiency errors tend to compensate one another, and that the total for the year may be fairly accurate in spite of the inaccuracy of the daily items of which it is the sum.

MORTYN J. SALTER.

Bank House, Mickleton, Glos. April 2nd, 1925.

Abnormal Weather at Ross-on-Wye

February was actually the eleventh consecutive month with excess of rainfall here. I cannot find a parallel to this, at all events not within the past 50 years. In 1903, each of the first ten months experienced a rainfall above normal. The average rain for the eleven months (April to February inclusive) is 26·22 in. and the actual fall in 1924-5 for same period reached 39·51 in. (over 50 per cent. surplus). The number of " days with measurable rain," however, was only 182, or 9 above the average for the period.

The past season has been strikingly abnormal. Time and again the highest maximum temperatures have been registered at such places as Skegness, Southend, Margate, Folkestone, whilst the mean temperature of some of the winter months has

* See *Meteorological Magazine, Sept.*, 1924, *p.* 193.

actually been higher in Kent, Essex and Sussex (also in London), than in parts of western England. This is strangely at variance with the long accepted truth that in winter isotherms tend to run north and south and show an increase in warmth with westerly longitude.

F. J. PARSONS.

The Observatory, Ross-on-Wye. March 7th, 1925.

[On the days in question (*e.g.*, February 13th and 26th), the general run of the isobars was from south-west to north-east over southern England with the centre of the depression near Ireland. The air which passed over eastern England during the day came from south of latitude 50° while that over western England came from a more northerly source, in the rear of the depression.

In March the succession of months with rainfall above normal was broken, the total rainfall for that month being only 14 mm. or 26 per cent. of the normal.—ED. *M.M.*]

NOTES AND QUERIES

The Airship R.33

THE breakaway of R.33 from her mooring mast at Pulham during stormy weather on April 16th, and her successful return, have already been widely reported, and the general circumstances of the event will be known to all. It may not, however, be superfluous to give here a few notes on the meteorological conditions prevailing at the time, as these have not been adequately dealt with in other accounts.

The period of strong westerly winds at Pulham commenced about 6 a.m., Wednesday, April 15th, with a depression centred close to the north coast of Scotland, and moving very little. Throughout Wednesday, while R.33 was still at the mooring mast, conditions were very squally, the mean wind fluctuating considerably, and a speed of 40 m.p.h. in gusts was frequently shown on the anemobiagraph record. The squalls were accompanied by showers of rain and hail. A particularly pronounced squall occurred about 8.45 p.m. At 8.40 p.m., after an interval of light winds, the wind was still only 4 m.p.h. Ten minutes later it was reaching 40 m.p.h. in gusts. This squall was accompanied by hail and thunder. It will be seen, therefore, that the ship successfully rode out some very bad weather during the day preceding her involuntary cruise, and it may be mentioned that during the whole of this period there was an emergency crew on board sufficient to handle the ship if she had broken away sooner.

During Wednesday night a secondary depression developed near the Hebrides and moved across southern Scotland to a position close to Newcastle by 7 a.m., Thursday, April 16th. On the southern side of this the westerly wind shown by the Pulham anemobiagraph became much steadier (*i.e.*, less squally), but gradually rose, and at 9.50 a.m. R.33 broke away from her moorings. At this time the anemobiagraph showed gusts up to 45 m.p.h., but, allowing for the greater height and more open exposure of the mooring mast, it is probable that the ship was exposed to speeds 20 per cent. to 25 per cent. greater than this.

The upper wind was of the order of 60 m.p.h. from west, and the ship was soon carried away over the North Sea, the damaged condition of her bow imposing a limit on the air speed available. It then became a nice problem in navigation to manœuvre the ship back to Pulham, taking into account the supply of petrol on board. Throughout the cruise, meteorological advice was passed to the ship, through Major G. H. Scott at Pulham, and on the basis of this the ship was manœuvred to make as much northing as possible while still in the strong westerly current on the southern side of the depression. Her motion at this time was towards the centre of the system. The depression was meanwhile passing across the North Sea to Denmark, and when, about 4 p.m., the north-westerly wind in its rear overtook R.33 she was off Texel. It was not expected that this north-westerly wind would remain for long greater than the air speed available for the ship, and, in fact, R.33 was driven by it no farther south than the region of Ymuiden (Holland), in about the same latitude as Pulham. Here she held her own from about 8 p.m., Thursday, April 16th, until 3 a.m., Friday, April 17th, when the ridge of high pressure already over the British Isles extended its influence to Holland, leading to a considerable diminution of wind speed over the southern North Sea. R.33 arrived at Pulham about 3.20 p.m., Friday, April 17th, when the crest of the ridge of high pressure lay over the station and a new Atlantic depression was already affecting the west of the British Isles. Shortly afterwards she was safely in her shed, after a cruise lasting nearly 30 hours.

The whole incident was a very skilful application by the airship staff of meteorological advice, and it only serves to emphasise how enormously important will be the meteorological organisation now being worked out for the airship routes to Egypt and India.

In conclusion, we offer our congratulations to Flight-Lieut. Booth and his crew on their very gallant and skilful performance in bringing R.33 back safe, though damaged, to her base at Pulham.

The Average Rainfall in the Isle of Wight

THE following table showing the average rainfall at Totland Bay, in the Isle of Wight, for different periods, has been contributed by Mr. John Dover.

Month.	10 years 1915-1924.	20 years 1905-1924.	30 years 1895-1924.	37 years 1888-1924.
	In.	In.	In.	In.
January ...	3·14	2·73	2·56	2·50
February ...	2·24	2·06	2·10	2·00
March ...	2·25	2·56	2·39	2·24
April ...	1·96	1·88	1·87	1·79
May ...	1·80	1·60	1·67	1·65
June ...	1·24	1·60	1·70	1·71
July ...	2·69	2·12	1·88	2·13
August ...	2·22	2·22	2·28	2·37
September ...	2·59	2·25	2·31	2·23
October ...	3·09	3·98	3·75	4·08
November ...	2·05	2·67	2·67	2·78
December ...	3·84	3·84	3·58	3·33
YEAR ...	29·11	29·51	28·76	28·81

It will be noticed that in the last ten years the three winter months December, January and February, have all been wet ; so have April, May, July and September. On the other hand, June, October and November have been dry. October and November yielded 51 in. in the last ten years ; 81 in the previous ten. Of the whole period the wettest month was October, 1891, with its 10·45 in. The great drought, which began with February, 1921, and lasted so long, had a great effect on the springs of this neighbourhood for the three succeeding years. The rainfall for the 49 months beginning February 1st, 1921, and ending February 28th, 1925, amounts to 116·30 in. This is below the average of 117·92 in.

Floods in Peruvian Desert

AN account of the unusually heavy rains which caused great damage in southern Peru during the last ten days of January, is given in the March number of the *Bulletin of the American Meteorological Society*. The Harvard Observatory at Carmen Alto reported that the rainfall in the Arequipa region was the greatest since February, 1893. The average annual rainfall there is about 100 mm. (4 in.), but during the last ten days of January 132 mm. (5·18 in.) were recorded.

Floods occurred in many parts of the desert, and on the

Southern Railway, between Arequipa and Mollendo, bridges have had to be constructed over gulleys washed out by the floods. Much of the desert has been converted into a fertile plain, as, owing to the unusual rain and warmth, thousands of hardy seeds, which had lain dormant in the ground through the long period of drought, have grown with incredible vigour. The desert is interlaced with streams. The greatest loss is that of the guano on the islands off Peru.

In explanation of the heavy rains, Dr. R. C. Murphy, Assistant Director of the American Museum of Natural History, points out that a warm ocean current called El Nina, or the Child, because it generally comes before Christmas, reached the coasts of Ecuador on January 12th, three weeks later than usual, and sweeping along the west coast of South America, passed further to the south and in greater volume than has been known before. Normally the southern coasts of Peru are washed by the cold Humboldt current, which flows northwards, and no rain falls between these coasts and the Andes, the prevailing winds being S E. This year the warm current, El Nina, flowed southwards, passed these coasts to Chile, and heavy rain fell in many places where ordinarily there is no rain. The speed and temperature of the current was measured on January 12th, when it reached Ecuador. It was found that the temperature of the ocean rose from 63 to 75 degrees in a day.

When is most Dew Deposited

IT is common knowledge that dew is to be found on the grass very soon after sunset in suitable weather and that there is most dew in the early morning. There are apparently no systematic observations of dew to show how much is deposited from hour to hour. Will any observer who has to be up at night undertake an investigation? The question is of considerable interest, because the rate at which dew is forming must be related to the state of the sky, the strength of the wind and its turbulence, as well as to the humidity of the air and the condition of the soil.

A method of measurement of the amount of dew was evolved by Dr. V. Parchinger* and should be appropriate for the present problem. The dew is sopped up on blotting paper and the increase of weight gives the amount of dew.

The Evaporation of Small Waterdrops

IT is a well-known theorem of Lord Kelvin's that the vapour pressure over a convex liquid surface is greater than that over a plane surface. It is a corollary from this theorem that small drops of liquid should evaporate even when in a saturated

* *Met. Zs.* 35 (1918), p. 48.

atmosphere, and, moreover, the smaller the drop the more rapid should be the evaporation. The question, how is it that clouds and drizzle persist, has not been faced by most meteorologists. Two Russian physicists (who do not seem to have been interested in drops as meteorological phenomena) have published recently the results of some experiments which throw new light on this question.*

In these experiments single drops were watched for long periods—up to an hour or more. The drop under observation was kept from falling by the adjustment of the strength of an electric field; the field was occasionally annihilated, the drop began to fall, and, from the rate at which it fell, the radius could be calculated. Before the drop was out of sight it was rescued by switching the electric field on again.

The drops used were between 1μ and 3μ in diameter, and therefore small for cloud particles.

The first result of the investigation is that a newly formed drop evaporates quickly but that the process gets slower and slower. The rate of evaporation depends on the atmosphere. In a hydrogen atmosphere the drops disappear so quickly that measurements are not possible, and, on the other hand, in an atmosphere of carbon dioxide evaporation is slower than in air. It is thought that the action is due to the gas absorbed by the water; the authors suggest that when the water of the drop is well aerated the molecules reach the surface with difficulty and evaporation is retarded.

The investigation included a search for any effect of varying the electric charge on the drops. It was found that with the range of charges that was practicable the rate of evaporation was not affected.

The Lesson of the Grimy Bridge

THE reading of the "Lesson of the Grimy Bridge" in the March number of this magazine has been questioned by more than one reader on the ground that steam trains pass occasionally along the District Railway as well as electric trains. It must be pointed out, however, that even if the smoke deposited on the bridge does come from the steam engines it remains to be explained why it is that over either pair of metals the smoke patch is on the forward side of the bridge.

The Scope of Irrigation in South Africa

IN the *Geographical Journal* for April there is an interesting article by Mr. C. Daryll Ford on "Irrigation in South Africa."

* Die Verdampfung kleiner Wassertropfen. N. Gudris and L. Kulikowa. *Zeitschrift für Physik*, vol. xxv., part 2. Berlin, 1924.

He points out that a reliable rainfall of 24 inches a year, well distributed through the seasons, is necessary for agriculture without irrigation, but about half of South Africa receives less than 15 inches a year, and the rainfall occurs mainly in summer, when it is of least use. The annual evaporation is 60 or 70 inches, and as the rain falls in short heavy showers preceded and followed by intense sunshine, it is largely re-evaporated without penetrating the soil. There is thus great need for irrigation, and as this need is greatest in spring, when the rainfall is least, water has to be conserved from the winter. Unfortunately only a small part of the soil is rich enough to warrant the expense of such works.

Danish Meteorology

THE Danish Meteorological Institute has always paid great attention to marine meteorology and since 1880 has published a Nautical-Meteorological Annual. The volume for 1924 which has recently been received, contains a large amount of information relating to the meteorology of the North Atlantic and Arctic waters. Special attention is devoted to ice ; the ice conditions in Danish waters during the winter 1923-1924 are fully described, with a chart, while the well-known series of reports and charts of ice-conditions in Arctic waters is continued. Two charts showing the drift of bottles from the neighbourhood of Iceland are given, followed by a series of monthly charts of surface temperatures in the North Atlantic. The greater part of the volume is occupied by detailed observations at a number of light-ships in Danish waters, including observations of wind, cloud and weather, air temperature, currents and sea temperature at the surface and at various depths. The volume concludes with a bibliography of the publications of the Nautical Department of the Danish Meteorological Institute since 1880.

Reprints of Meteorological Papers

ABOUT two years ago it was arranged that reprints of papers on meteorological subjects appearing in the *Proceedings of the Royal Society* should be available for fellows of the Royal Meteorological Society. Fellows wishing to take advantage of this privilege were asked to make a deposit of ten shillings to cover the cost of the reprints and of postage. Several papers of great interest to meteorologists have been circulated and the long standing grievance that the Royal Society gets the cream of English work in our branch of science is almost eliminated. The arrangement has recently been extended to include meteorological papers published in the *Philosphical Magazine*. The last papers to be circulated were " On the Formation of Water Waves

by Wind," by Harold Jeffreys from the *Proceedings of the Royal Society* and "Turbulence and Vertical Temperature difference near Trees," by Lewis F. Richardson from the *Philosphical Magazine*. Mr. Richardson's paper is the one he communicated to the British Association at Toronto. It is announced that the first ten shilling deposits have now run out. It will be interesting to learn how many fellows show their appreciation of the scheme by renewing their support. It would be highly advantageous if meteorologists publishing papers in other non-specialised journals could utilise the organization and thereby place their work in the hands of those who are most likely to be interested in it.

Radiation from the Sky

RADIATION MEASURED AT BENSON, OXON, 1924.

Unit: one gramme calorie per square centimetre per day.

ATMOSPHERIC RADIATION only (dark heat rays).

Averages for Readings

		Jan.	Feb.	Mar.
Cloudless days:—				
Number of readings	n	0	5	5
Radiation from sky in zenith ...	π I	—	458	393
Total radiation from sky ...	J	—	493	420
Total radiation from horizontal black surface on earth ...	X	—	661	659
Net radiation from earth ...	X—J	—	168	239

DIFFUSE SOLAR RADIATION (luminous rays).

Averages for Readings between 9 h. and 15 h. G.M.T.

Cloudless days:—				
Number of readings	n_0	0	3	2
Radiation from sky in zenith ...	πI_0	—	17	30
Total radiation from sky ...	J_0	—	24	39
Cloudy days:—				
Number of readings	n_1	3	1	2
Radiation from sky in zenith ...	πI_1	20	22	98
Total radiation from sky ...	J_1	15	23	89

Unit for I = gramme calorie per day per steradian per square centimetre.

Unit for J and X = gramme calorie per day per square centimetre.

For description of instrument and methods of observation, see *The Meteorological Magazine*, October, 1920, and May, 1921.

Review

Why the Weather? By C. F. Brookes, Ph.D. (Harvard). 8vo, $7\frac{1}{2} \times 5\frac{1}{4}$, pp. xvi. + 310. (*Illus.*) New York: Harcourt, Brace and Company; and London: Chapman and Hall, Ltd. 1924. 8s. 6d. net.

Daily explanations of the weather, given by Dr. Brooks to classes at Clark University, were reported to a local newspaper; these publications aroused interest, and led to the preparation of similar but more generalised short notes, which have appeared in various United States and Canadian newspapers. These notes now appear in book form. There is need for a book to which reference can readily be made when a reliable explanation of weather happenings is wanted. "Why the Weather?" with its ample index and concise paragraphs (each paragraph has its own heading) covering a wide meteorological field, meets this need excellently. At the same time a connected story of the weather has been maintained, commencing with the phenomena most common to spring and continuing through each of the seasons in turn. The writing is always entertaining, and the reader's interest is never allowed to flag. What could be better in a popular book than: "The fact that dark colours absorb the heat of the sun while light colours reflect it, thus permitting a surface to remain cool, is put to good use in the Sierra Nevada Mountains. In the spring the highways of the high passes are buried deep in accumulations of snow, sometimes even to a depth of 30 feet, and the normal rate of evaporation is so slow that automobile traffic is seriously delayed until long after roads at lower levels are open. It has sometimes required weeks to melt and break a way through. Then some bright mind conceived the idea of scattering black soil and dark coloured ashes over the snow surface. It worked beautifully: the snow went almost magically fast as compared with previous experience, and interference with traffic was greatly shortened." "Some bright mind" and "almost magically fast" may not be scientific, but they make excellent reading.

Snow, hurricanes and thunderstorms are discussed at some length, the opportunities for studying extreme cases of these phenomena being more frequent in America than in many other parts of the globe; the sections of the book devoted to them are instructive for meteorologists and laymen alike. The merit of the book as a popular instructor, however, lies in the clear explanation of present weather by reference to the past history of the air. The physical processes involved in the flow of warm air to colder latitudes and cold air to warmer latitudes, are analysed without presenting any technical difficulties.

Recent developments in meteorology are not omitted. Dr.

Brooks has something to say about " polar fronts," the making of long range forecasts based mainly on the state of the Arctic ice, the separation of electrical charges accompanying the splitting up of raindrops.

Dr. Brooks is occasionally dogmatic where the subject is still open to controversy, but if one is to be " popular" one must doubtless express only one point of view, and that with conviction : he says, for instance, " if a ' low ' goes by in too much of a hurry, it sometimes requires another immediately succeeding ' low ' to finish the job of establishing fair and much colder weather. A strong low pressure area may pass so rapidly through the region that there is neither time for much warm air to come north on its front, nor for much cold air to travel far south in its rear " ; and again, in an explanation of the sea breeze, he says : " The heated air (over the land) expands, and some of it spills over above the denser air over the water, lowering the pressure over the land and raising it over the water." Both may be true and aptly worded explanations of what happens, but the author gives a suggestion of finality to the theories he propounds which might lead an unsuspecting reader to think that they were as generally accepted by meteorologists as, say, the theory of the production of the normal solar halo.

Dr. Brooks has succeeded in writing an interesting book which should make a wide appeal to those who want to know something about meteorology but have previously hesitated lest the text book should prove too dry.

M. T. SPENCE.

Obituary

Captain Alfred Carpenter, D.S.O., R.N.—We record with deep regret the death of Captain Alfred Carpenter, D.S.O., R.N., retired, which occurred on April 30th at his residence at Sanderstead at the age of 77 years. His scientific tastes showed themselves early, and secured for him an appointment on the famous *Challenger* expedition. The associations then formed affected his whole future career, for his subsequent commands were in surveying ships, where scientific work is the primary consideration. But he saw much active war service as well. He was awarded the D.S.O. for his services in the Burmese war, being the first Naval Officer to receive that distinction. From 1884 to 1889 he was in charge of the Marine Survey of India.

As a meteorologist he did good work. We owe to him a number of interesting papers in the *Quarterly Journal of the Royal Meteorological Society*, mostly descriptions of remarkable tropical hurricanes, and in his later years he contributed a number of notes on observations of the green flash. He was a staunch friend of the Meteorological Office, to which he contri-

buted no fewer than twenty "excellent" logs, the majority from eastern seas, during his service afloat. His most active association with the Office did not come until after he had retired from active service. In 1901 the Office was asked by the London County Council to arrange for an inquiry into London fogs with a view to forecasting, if possible, the local incidence of these phenomena, and thus enabling more adequate provision to be made for coping with the loss and inconvenience which they cause. Captain Carpenter was invited by the Meteorological Council to take charge of the inquiry, and during the winter of 1901-02 he organised a network of observing stations among the Fire Stations in the Metropolis. His report on the observations was subsequently issued as an official publication of the Office. It was a matter of great regret to the Council that the state of his health prevented him from continuing the work during the following winter.

R. G. K. LEMPFERT.

News in Brief

We learn with regret of the death at Nice, at the age of 72 years, of M. Joseph Vallot, Director of the Mont Blanc Observatory. It will be remembered* that M. Vallot founded the first Observatory on the mountain in 1890, and replaced it by the present one in 1898. He made no less than 35 expeditions to the summit and to his observatory.

We are informed that Colonel Enrique Meseguer has been appointed Director of the Spanish Meteorological Service in succession to Colonel J. Cruz-Condé.

On Friday, May 8th, Sir Gilbert T. Walker, C.S.I., F.R.S., delivered a lecture at the Royal Society of Arts on *Indian Meteorology*.

The balloon sent up at Kew Observatory on the occasion of the visit of the Royal Meteorological Society, fell near Godalming after rising to a height of 12½ kilometres (42,000 feet). The stratosphere was reached at 11·1 kilometres.

Erratum.

February, 1925, page 25, line 22, *for* "Melbourne" *read* "Roebourne."

* *Meteorological Magazine*, 59 (1924), 37.

The Weather of April, 1925

THE weather during April was generally changeable and showery, with many sunny periods and a rainfall above normal in most districts. Snow fell in several parts of Scotland during the first few days of the month, and lay more than 6 in. deep in Edinburgh on the 1st. A ridge of high pressure moved across England on the 3rd, and was associated with sharp frost on the morning of the 4th, when a grass minimum temperature of 11° F. was recorded at Oundle in Northamptonshire. Pressure subsequently remained low near Ireland for many days, giving southerly winds, moderate rain and warmer weather. Maximum readings of 66° F. were recorded at S. Farnborough on the 8th and Worksop on the 12th. Local thunderstorms were experienced during this period, and fog or mist occurred in the eastern and southern districts of Great Britain on several mornings. On the 13th there was a change to westerly winds and a deep depression passing across the north of Scotland was associated with high winds and gales in many parts on the 15th and 16th. Gusts of over 60 m.p.h. were reported from several places, and on the morning of the 16th gusts of 80 m.p.h. (83 m.p.h. at Fleetwood) occurred on the north-west coasts of England, while near the east coast the R.33 was torn from its moorings at Pulham. Between the 19th and 21st a ridge of high pressure passed across the British Isles, and fair or fine weather prevailed. Over 13 hours bright sunshine were recorded in parts of Ireland on the 19th and 20th, and screen minimum temperatures below 32° F. occurred in many places. High north-east winds and gales were experienced in the Straits of Dover early in the morning of the 21st. As the high pressure ridge moved southwards a depression developed rapidly off the Hebrides on the 22nd, and high south-westerly winds occurred in exposed places in the north and west, with heavy rain in northern England. During the last week the weather continued generally unsettled, though with many bright periods. Local thunderstorms were of frequent occurrence, especially in the south-eastern districts.

The total rainfall for the month was more than twice the normal in parts of south Scotland and at a few places in Sussex and Surrey, e.g. : 249 per cent. of the normal fell at Biggar (Lanarkshire) and 237 per cent. at Patching Farm (Sussex). Only in a few districts in the west of England was the rainfall less than normal.

Pressure was below normal over the northern part of the North Atlantic and over western Europe (except Spain and Portugal), the deficit exceeding 5 mb. over the north of Scotland, the Faroes, the greater part of Iceland, and the coast of Norway. Over the central and southern parts of the North Atlantic and over the

Iberian Peninsula pressure was slightly above normal. This distribution favoured south-westerly winds over western Europe, and temperatures in Scandinavia and at Spitsbergen were several degrees above normal, while rainfall generally showed a slight excess. In Sweden, temperature was about 4° F. above normal except in the central mountainous regions where it was 3° F. below normal. Heavy rains occurred generally between the 14th and 17th, but the total precipitation for the month was normal. In Norway a heavy landslip occurred near the mouth of the river Glommen on the 17th and 18th. This destroyed much farming land, and formed so large a barrier in the river that many of the steamers at Sannesund had to leave there with little or no cargo. Early in the month three members of a party of tourists were killed and twenty-three injured by lightning at Königstein, near Dresden.

In Canada, the Assiniboine river was in flood at the beginning of the month, and dynamite was being used to break up the huge ice jambs. A tornado passed within a few miles of Miami, Florida, on April 5th. Three people were killed, and much damage done to property in the vicinity of its path. On the 23rd unusual conditions prevailed in the United States: heavy snowstorms occurred in Montana, the snowfall amounting to 17 in. at Butte, while very high temperatures for the time of year occurred in the eastern regions, a maximum reading of 93° F. being recorded at Washington (D.C.), and one of 92° F. at Chattanooga (Tennessee). On the same day rain fell in northern Texas, breaking the drought in that region.

The total rainfall for the month in Australia was considerably below normal, except in the extreme north where 15·25 in. or 274 per cent. of the normal fell in the northern part of Cape York Peninsula. In many of the more southerly districts of Queensland there was no rain at all throughout the month.

The special message from Brazil states that the rainfall was plentiful in the northern regions, being 54 mm. above normal, but scarce in the central and southern regions, where it was 58 mm. and 20 mm. below normal respectively. Numerous anticyclones of medium intensity passed across the country. The condition of the crops is generally good. Pressure at Rio de Janeiro was 1·1 mb. below normal, and temperature 0·7° F. above normal.

Rainfall April, 1925—General Distribution

England and Wales ..	133	per cent. of the average 1881-1915.
Scotland	164	
Ireland	154	
British Isles	145	

Rainfall: April, 1925: England and Wales

CO.	STATION.	In.	mm.	Per-cent. of Av.	CO.	STATION.	In.	mm.	Per-cent of Av.
Lond.	Camden Square.....	1·63	41	106	*War.*	Birminghm, Edgbaston	2·17	55	125
Sur .	Reigate, Hartswood...	3·19	81	206	*Leics*	Thornton Reservoir ..	1·74	44	102
Kent.	Tenterden, View Tower	2·46	63	152	,, .	Belvoir Castle.....	1·36	35	89
,, .	Folkestone, Boro. San.	3·47	88	...	*Rut .*	Ridlington.....	1·68	43	...
,, .	Broadstairs, St Peter's	2·03	52	147	*Linc.*	Boston, Skirbeck	1·93	49	143
,, .	Sevenoaks, Speldhurst.	2·65	67	...	,, .	Lincoln, Sessions House	1·55	39	112
Sus .	Patching Farm.....	4·14	105	237	,, .	Skegness, Estate Office.	1·91	49	143
,, .	Brighton, Old Steyne .	...	..	...	,, .	Louth, Westgate	2·29	58	137
,, .	Tottingworth Park....	3·33	85	180	,, .	Brigg	2·18	55	139
Hants	Ventnor, Roy.Nat.Hos.	2·65	67	158	*Notts.*	Worksop, Hodsock....	1·84	47	125
,, .	Fordingbridge, Oaklnds	2·56	65	140	*Derby*	Mickleover, Clyde Ho..	1·82	46	105
,, .	Ovington Rectory	3·38	86	179	,, .	Buxton, Devon. Hos...	3·78	96	129
,, .	Sherborne St. John Rec.	2·48	63	140	*Ches.*	Runcorn, Weston Pt...	1·75	44	101
Berks	Wellington College...	1·87	47	116	,, ..	Nantwich, Dorfold Hall	1·39	35	...
,, .	Newbury, Greenham..	2·32	59	127	*Lancs*	Manchester, Whit. Pk.	2·01	51	105
Herts.	Bennington House....	...	..	...	,, ..	Stonyhurst College....	2·71	69	100
Bucks	High Wycombe	1·90	48	121	,, ..	Southport, Hesketh...	1·67	43	90
Oxf..	Oxford, Mag. College..	2·40	61	156	,, ..	Lancaster, Strathspey.	2·51	64	...
Nor .	Pitsford, Sedgebrook..	1·81	46	118	*Yorks*	Sedbergh, Akay	5·97	152	184
,, .	Eye, Northolm.....	1·13	29	...	,, .	Wath-upon-Dearne ...	2·70	69	171
Beds.	Woburn, Crawley Mill.	1·59	41	106	,, .	Bradford, Lister Pk...	2·79	71	139
Cam.	Cambridge, Bot. Gdns.	1·72	44	126	,, .	Wetherby, Ribston H..	3·15	80	179
Essex	Chelmsford, CountyLab	1·21	31	95	,, .	Hull, Pearson Park ...	2·12	54	136
,, .	Lexden, Hill House...	1·75	44	...	,, .	Holme-on-Spalding ...	2·47	63	...
Suff .	Hawkedon Rectory ...	2·75	70	179	,, .	West Witton, Ivy Ho..	3·76	95	...
,, .	Haughley House.....	2·33	59	...	,, .	Felixkirk, Mt. St. John	2·72	69	163
Norf.	Beccles, Geldeston....	2·47	63	168	,, .	Pickering, Hungate ...	2·57	65	...
,, .	Norwich, Eaton	2·50	63	146	,, .	Scarborough.....	2·40	61	154
,, .	Blakeney	2·45	62	191	,, .	Middlesbrough	2·04	52	149
,, .	Swaffham	2·19	56	148	,, .	Baldersdale, Hury Res.	4·08	104	174
Wilts.	Devizes, Highclere....	1·97	50	104	*Durh.*	Ushaw College	3·24	82	171
,, .	Bishops Cannings	2·11	54	104	*Nor .*	Newcastle, Town Moor.	2·92	74	178
Dor .	Evershot, Melbury Ho.	2·71	69	115	,, .	Bellingham, Highgreen	3·43	87	...
,, .	Weymouth, Westham..	2·29	58	138	,, .	Lilburn Tower Gdns...	3·34	85	...
,, .	Shaftesbury, Abbey Ho.	3·14	80	147	*Cumb*	Geltsdale.....	4·84	123	...
Devon	Plymouth, The Hoe...	1·90	48	86	,, .	Carlisle, Scaleby Hall .	3·35	85	172
,, .	Polapit Tamar	3·32	84	142	,, .	Seathwaite M.....	16·00	406	216
,, .	Ashburton, Druid Ho..	3·89	99	128	*Glam.*	Cardiff, Ely P. Stn.....	2·78	71	110
,, .	Cullompton	3·54	90	156	,, .	Treherbert, Tynywaun	6·05	154	...
,, .	Sidmouth, Sidmount ..	3·09	79	145	*Carm*	Carmarthen Friary....	3·18	81	116
,, .	Filleigh, Castle Hill ...	3·89	99	...	,, .	Llanwrda, Dolaucothy.	4·23	107	128
,, .	Barnstaple, N.Dev.Ath.	2·95	75	139	*Pemb*	Haverfordwest, School	2·69	68	103
Corn.	Redruth, Trewirgie ...	3·59	91	125	*Card.*	Gogerddan.....	2·58	65	99
,, .	Penzance, Morrab Gdn.	2·55	65	105	,, .	Cardigan, County Sch. .	2·35	60	...
,, .	St. Austell, Trevarna..	4·08	104	145	*Brec .*	Crickhowell, Talymaes	3·50	89	...
Soms	Chewton Mendip	3·41	87	115	*Rad .*	Birm.W.W.Tyrmynydd	5·20	132	141
,, .	Street, Hind Hayes ...	2·37	60	...	*Mont.*	Lake Vyrnwy	3·22	82	107
Glos..	Clifton College	1·73	44	80	*Denb.*	Llangynhafal	2·28	58	...
,, .	Cirencester	2·04	52	106	*Mer .*	Dolgelly, Bryntirion..	4·24	108	116
Here.	Ross, Birchlea	1·75	44	92	*Carn.*	Llandudno	1·31	33	72
,, .	Ledbury, Underdown.	2·14	54	118	,, .	Snowdon, L. Llydaw 9	7·87	200	...
Salop	Church Stretton.....	2·42	61	144	*Ang .*	Holyhead, Salt Island.	1·70	43	82
,, .	Shifnal, Hatton Grange	1·64	42	98	,, .	Lligwy	2·20	56	...
Staff.	Tean, The Heath Ho...	1·77	45	89	*Isle of Man*				
Worc.	Ombersley, Holt Lock.	2·22	56	146		Douglas, Boro' Cem...	3·25	83	132
,, .	Blockley, Upton Wold.	2·48	63	128	*Guernsey*				
War.	Farnborough.....	2·63	67	134		St. Peter P't, Grange Rd	2·85	72	142

Rainfall: April, 1925: Scotland and Ireland

CO.	STATION	In.	mm.	Per-cent. of Av.	CO.	STATION.	In.	mm	Per-cent. of Av.
Wigt.	Stoneykirk, Ardwell Ho	2·88	73	137	*Suth.*	Loch More, Achfary...	5·31	135	109
,, .	Pt. William, Monreith .	3·16	80	...	*Caith*	Wick	1·64	42	82
Kirk.	Carsphairn, Shiel.	8·20	208	...	*Ork .*	Pomona, Deerness	2·35	60	113
,, .	Dumfries, Cargen.....	4·84	123	181	*Shet .*	Lerwick	2·89	73	127
Dum	Drumlanrig	5·62	143	228					
Roxb	Branxholme	3·93	100	208	*Cork.*	Caheragh Rectory	5·77	147	...
Selk .	Ettrick Manse.....	6·65	169	...	,, ..	Dunmanway Rectory.	5·59	142	135
Berk.	Marchmont House	3·39	86	168	,, ..	Ballinacurra	4·78	121	185
Hadd	North Berwick Res....	2·24	57	160	,, ..	Glanmire, Lota Lo. ...	5·54	141	198
Midl	Edinburgh, Roy. Obs..	2·89	73	211	*Kerry*	Valencia Obsy.	5·67	144	154
Lan	Biggar	4·31	109	249	,, .	Gearahameen	9·00	229	...
Ayr .	Kilmarnock, Agric. C..	3·98	101	193	,, .	Killarney Asylum.....	5·74	146	173
,, .	Girvan, Pinmore.....	4·50	114	152	,, .	Darrynane Abbey	5·29	134	154
Renf.	Glasgow, Queen's Pk..	4·03	102	205	*Wat .*	Waterford, Brook Lo..	4·07	103	160
,, .	Greenock, Prospect H..	7·24	184	199	*Tip .*	Nenagh, Cas. Lough...	5·44	138	217
Bute.	Rothesay, Ardencraig.	5·62	143	189	,, .	Tipperary	4·74	120	...
,, .	Dougarie Lodge	4·71	120	...	,, .	Cashel, Ballinamona ..	4·63	118	185
Arg .	Ardgour House	8·64	219	...	*Lim .*	Foynes, Coolnanes	3·31	84	136
,, .	Manse of Glenorchy..	7·09	180	...	,, .	Castleconnell Rec.	5·55	141	...
,, .	Oban	4·78	121	...	*Clare*	Inagh, Mount Callan ..	5·36	136	...
,, .	Poltalloch	5·25	133	179	,, .	Broadford, Hurdlest'n.	5·27	134	...
,, .	Inveraray Castle.....	...	..	...	*Wexf*	Newtownbarry	4·36	111	...
,, .	Islay, Eallabus.....	5·93	151	207	,, .	Gorey, Courtown Ho...	2·66	68	121
,, .	Mull, Benmore	9·80	249	...	*Kilk.*	Kilkenny Castle	2·99	76	137
Kinr.	Loch Leven Sluice	4·09	104	213	*Wic .*	Rathnew, Clonmannon	2·65	67	...
Perth	Loch Dhu	8·90	226	188	*Carl .*	Hacketstown Rectory .	3·69	94	139
,, ..	Balquhidder, Stronvar.	6·84	174	153	*QCo..*	Blandsfort House.....	3·52	89	135
,, ..	Crieff, Strathearn Hyd.	4·40	112	201	,,	Mountmellick	4·69	119	...
,, ..	Blair Castle Gardens ..	2·75	70	130	*KCo.*	Birr Castle.....	3·80	97	177
,, .	Coupar Angus School..	3·75	95	226	*Dubl.*	Dublin, FitzWm. Sq...	2·46	63	129
Forf.	Dundee, E. Necropolis.	2·87	73	169	,, .	Balbriggan, Ardgillan	2·14	54	108
,, .	Pearsie House.....	4·01	102	...	*Me'th*	Drogheda, Mornington	2·16	55	...
,, .	Montrose, Sunnyside..	2·85	72	157	,, .	Kells, Headfort.....	2·87	73	115
Aber.	Braemar Bank	3·50	89	152	*W.M*	Mullingar, Belvedere .	3·81	97	161
,, .	Logie Coldstone Sch. ..	2·33	59	116	*Long*	Castle Forbes Gdns....	3·81	97	159
,, .	Aberdeen, Cranford Ho	...	..	...	*Gal .*	Ballynahinch Castle ..	5·01	127	142
,, .	Fyvie Castle	2·51	64	...	*Mayo*	Mallaranny.....	6·00	152	...
Mor .	Gordon Castle.....	1·92	49	110	,, .	Westport House.....	4·49	114	166
,,	Grantown-on-Spey....	2·51	64	127	,, .	Delphi Lodge	8·22	209	...
Na .	Nairn, Delnies.....	1·64	42	109	*Sligo*	Markree Obsy.	4·27	109	162
Inv..	Ben Alder Lodge	5·25	133	...	*Cav'n*	Belturbet, Cloverhill..	3·98	101	174
,, .	Kingussie, The Birches	2·94	75	...	*Ferm*	Enniskillen, Portora ..	4·29	109	...
,, .	Loch Quoich, Loan....	10·00	254	...	*Arm.*	Armagh Obsy.	2·82	71	134
,, .	Glenquoich	10·27	261	158	*Down*	Warrenpoint	2·50	63	...
,, .	Inverness, Culduthel R.	1·78	45	...	,, .	Seaforde	3·78	96	144
,, .	Arisaig, Faire-na-Squir	...	..	...	,, .	Donaghadee, C. Stn...	2·83	72	143
,, .	Fort William.....	8·32	211	188	,, .	Banbridge, Milltown .	2·47	63	120
,, .	Skye, Dunvegan.....	4·90	125	...	*Antr.*	Belfast, Cavehill Rd. .	4·04	103	...
,, .	Barra, Castlebay	2·67	68	...	,, .	Glenarm Castle.....	5·17	131	...
R&C	Alness, Ardross Cas. ..	3·15	80	130	,, .	Ballymena, Harryville	4·26	108	161
,, .	Ullapool.....	4·30	109	...	*Lon .*	Londonderry, Creggan	4·86	123	189
,, .	Torridon, Bendamph..	7·00	178	134	*Tyr .*	Donaghmore	4·27	109	...
,, .	Achnashellach	6·90	175	...	,, .	Omagh, Edenfel	4·14	105	157
,, .	Stornoway	3·79	96	125	*Don .*	Malin Head	3·87	98	196
Suth.	Lairg	2·85	72	...	,, .	Rathmullen.....	4·51	115	...
,, .	Tongue Manse.....	3·09	79	118	,, .	Dunfanaghy	4·34	110	161
,, .	Melvich School.....	2·08	53	90	,, .	Killybegs, Rockmount.	4·36	111	121

Climatological Table for the British Empire, November, 1924

STATIONS	PRESSURE		TEMPERATURE							Relative Humidity	Mean Cloud Am'nt	PRECIPITATION			BRIGHT SUNSHINE	
			Absolute		Mean Values				Mean							
	Mean of Day M.S.L.	Diff. from Normal	Max.	Min.	Max.	Min.	½ max. and min.	Diff. from Normal	Wet Bulb.			Am'nt	Diff. from Normal	Days	Hours per day	Percentage of possible.
	mb.	mb.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	%	0—10	mm.	mm.			
London, Kew Obsy.	1018·4	+ 3·8	60	27	51·1	41·5	46·3	+ 2·3	44·5	85	7·6	58	+ 2	12	1·3	15
Gibraltar	1017·9	— 0·1	77	46	64·9	53·6	59·3	— 1·2	55·7	77	5·9	161	— 1	16	...	...
Malta	1017·0	+ 1·3	76	52	68·4	60·1	64·3	+ 1·3	59·0	77	4·4	55	— 26	12	6·2	61
Sierra Leone	1013·1	+ 2·3	89	67	86·5	71·0	78·7	— 2·5	75·9	78	6·1	140	+ 6	14	...	...
Lagos, Nigeria	1010·0	— 0·8	90	71	87·9	75·9	81·9	+ 0·6	78·7	78	4·8	21	— 45	6	...	...
Kaduna, Nigeria	1014·2	+ 2·9	94	64	90·6	69·9	80·3	+ 4·1	71·9	70	1·0	0	— 1	0	...	...
Zomba, Nyasaland	1009·1	+ 0·1	96	61	90·3	67·4	78·9	+ 3·8	...	76	4·5	18	—124	8	...	...
Salisbury, Rhodesia	1009·1	— 0·5	92	55	81·9	60·2	71·1	+ 0·2	62·2	56	5·4	110	+ 18	16	...	...
Cape Town	1017·2	+ 1·5	88	42	70·9	54·7	62·8	— 0·3	58·9	66	4·5	38	+ 11	12	...	...
Johannesburg	1013·0	+ 0·2	82	43	72·0	53·1	62·5	— 0·9	54·5	67	6·1	104	— 4	14	7·1	53
Mauritius	1015·9	— 0·2	86	58	82·4	65·8	74·1	— 1·4	68·0	72	4·9	36	— 4	9	9·4	72
Bloemfontein	...	...	93	40	78·1	52·4	65·3	— 3·1	56·3	55	4·8	50	— 8	9	...	...
Calcutta, Alipore Obsy.	1012·5	— 0·8	87	62	80·1	68·1	74·1	+ 1·0	68·0	84	5·4	47	+ 33	5*	...	...
Bombay	1010·6	— 1·3	90	69	86·6	72·4	79·5	— 0·8	68·4	69	1·9	10	0	1*	...	...
Madras	1009·4	— 1·9	89	67	84·1	72·5	78·3	— 0·4	73·6	84	8·1	409	+ 84	13*	...	...
Colombo, Ceylon	1009·3	— 0·8	87	70	85·7	73·9	79·8	— 0·5	76·6	72	7·1	244	— 63	16	6·4	54
Hong Kong	1018·4	+ 0·8	81	49	73·4	63·8	68·6	— 1·1	59·6	57	3·2	0	— 36	0	8·5	77
Sandakan	...	...	89	73	87·0	74·6	80·8	— 0·2	76·4	81	...	650	+277	19	...	...
Sydney	1012·6	— 1·1	94	51	72·9	58·3	65·6	— 1·4	59·8	70	6·0	78	+ 5	14	6·8	49
Melbourne	1011·7	— 2·5	87	45	69·6	52·9	61·3	0·0	56·2	65	6·6	108	+ 52	16	5·7	41
Adelaide	1013·2	— 1·9	101	42	76·5	55·0	65·7	— 1·2	56·4	49	5·8	48	+ 19	12	8·1	58
Perth, W. Australia	1014·4	— 0·9	94	48	74·7	55·8	65·3	— 0·5	58·1	63	4·9	66	+ 46	13	8·0	58
Coolgardie	1011·7	— 1·4	109	47	85·4	55·8	70·6	— 0·2	57·7	30	3·3	7	— 10	2	...	...
Brisbane	1013·3	— 1·0	91	61	81·0	65·3	73·1	— 0·5	67·3	65	5·2	160	+ 68	14	7·5	55
Hobart, Tasmania	1008·6	— 0·8	78	40	64·6	48·8	56·7	— 0·5	51·2	65	7·1	82	+ 18	21	7·1	49
Wellington, N.Z.	1016·7	+ 5·1	73	43	64·6	52·9	58·7	+ 1·9	53·9	72	6·4	74	— 14	12	7·2	50
Suva, Fiji	1011·3	+ 0·2	85	67	83·4	71·9	77·7	+ 0·5	74·6	80	5·5	233	— 9	16	...	...
Apia, Samoa	1011·1	+ 1·6	88	72	81·1	75·6	78·4	— 0·3	76·8	77	5·3	260	+ 24	17	7·1	56
Kingston, Jamaica	1011·3	— 1·1	90	66	85·5	71·0	78·3	— 1·0	73·3	77	8·1	264	+184	14	...	...
Grenada, W.I.	1011·9	+ 1·3	89	70	84·0	74·7	79·3	0·0	75·5	81	5·2	250	+ 42	22	...	...
Toronto	1015·9	— 0·9	68	13	46·2	31·8	39·0	+ 2·7	34·1	76	6·0	24	— 51	9	3·7	38
Winnipeg	1015·8	— 0·9	41	— 5	26·0	14·1	20·1	— 0·7	...	...	6·3	29	+ 5	15	2·4	26
St. John, N.B.	1014·2	+ 0·3	57	14	44·3	32·8	38·5	+ 1·8	36·1	83	6·7	77	— 35	11	3·2	34
Victoria, B.C.	1018·1	+ 2·6	55	31	47·1	39·7	43·4	— 1·0	41·3	89	7·5	107	— 57	21	2·7	29

* For Indian stations a rain day is a day on which 0·1 in. (2·5 mm.) or more rain has fallen.